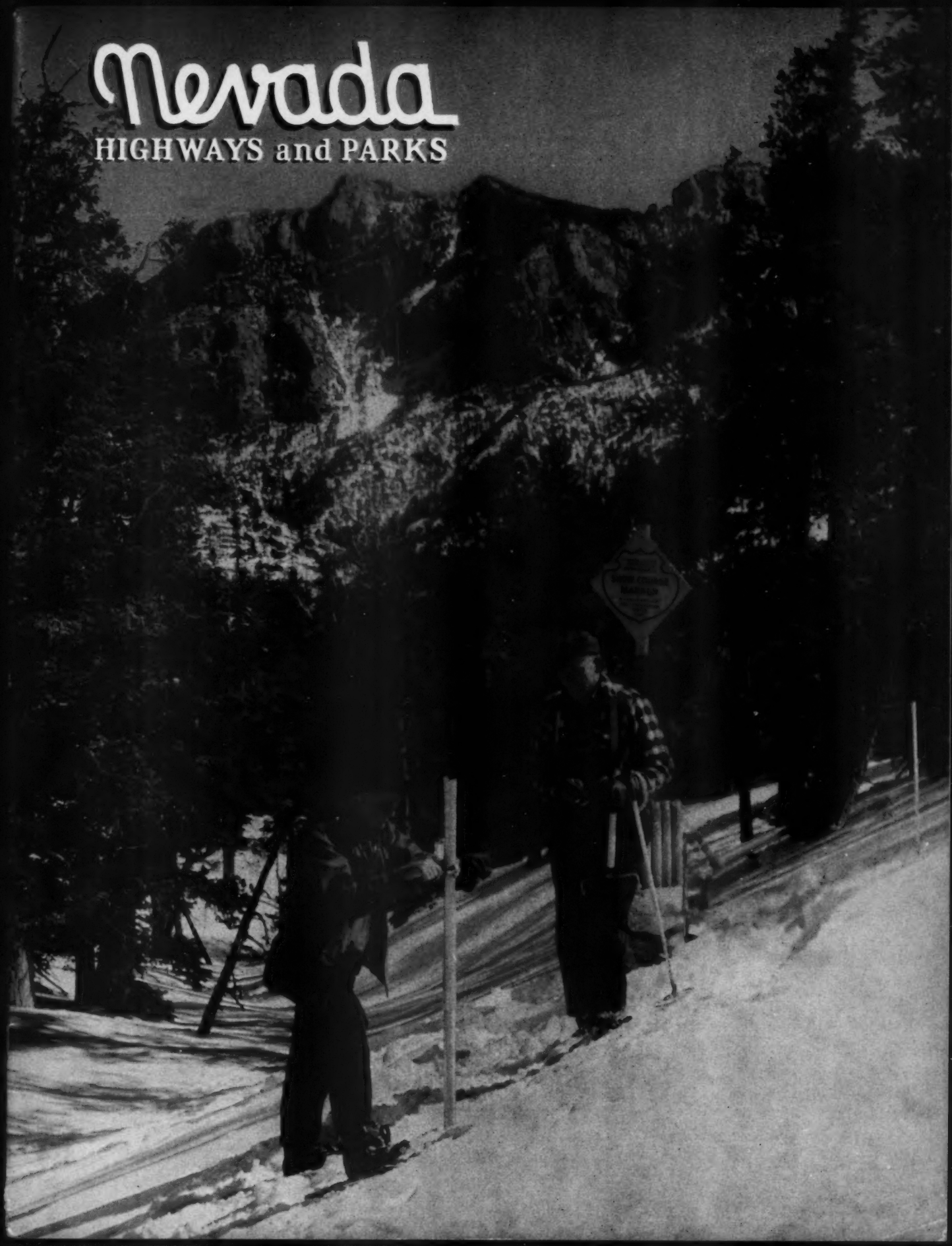
Nevada

HIGHWAYS and PARKS



Wintertime snow storms around Lake Tahoe often make it tough for Nevada highway crews. They work around the clock until the road is cleared.

—Photos by Ernie Mack, Reno

Snow overspreads the ground in Nevada forests and reaches down to the very edge of the small streams to form delightful winter wonderlands.

NEVADA
HIGHWAYS *and* PARKS

A Publication of the

Nevada Department of Highways

CARSON CITY, NEVADA

July 1952 December

Volume XII **Number 2**

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THE FRONT COVER

Snow surveys in the mountains of Nevada have been developed into an exact science. Many nations throughout the world have become greatly interested and have called upon the originator of the work, Dr. J. E. Church, of the University of Nevada, for assistance in starting such projects in their own lands. Our cover picture shows two members of the Nevada Cooperative Snow Survey, carrying their instruments to the field of operation.

NEVADA HIGHWAYS AND PARKS Magazine is published by the Department of Highways, in the State Printing Office at Carson City, and is issued for distribution, gratis, to persons interested in the present welfare and future development of Nevada. Nevada Department of Highways will be glad to mail a copy, or copies, upon request. NEVADA HIGHWAYS AND PARKS MAGAZINE IS NOT TO BE SOLD.

Nevada's Snow Crop Last Winter Was a "Humdinger"

WHEREVER mountains in Nevada stand white in winter, the bottom lands will be green in summer. That's a well-grounded Nevada statement. White mountain tops only, with the bottom lands brown all winter long, that's bad for the next summer. When both mountains and bottom lands are white, the going on the surface gets rough but the next summer will have water enough. Winters in the Silver State vary. Some are wild and others are mild. Over a long period of years, however, the extremes fairly well balance themselves. There may be a series of severe winters, followed by others more moderate. The cycles may run two or three years or they may run ten. Anyway you look at it there isn't much we can do about it, so Nevadans usually take their cold seasons in stride, harsh or gentle.

We know that when snow piles up in the high places it also fills the canyons with deep drifts; and the deeper the snow on the level, the finer will be the skiing on the slopes. The more snow, the more alfalfa we'll have in the lowlands, the cattle will be fatter, the fishin' will be better, and the forests greener after the frost goes out of the ground and the lilacs and the roses bloom again. So the winter storms, although we may complain at the time, are really blessings dressed in white and riding on the wings of zero zephyrs.

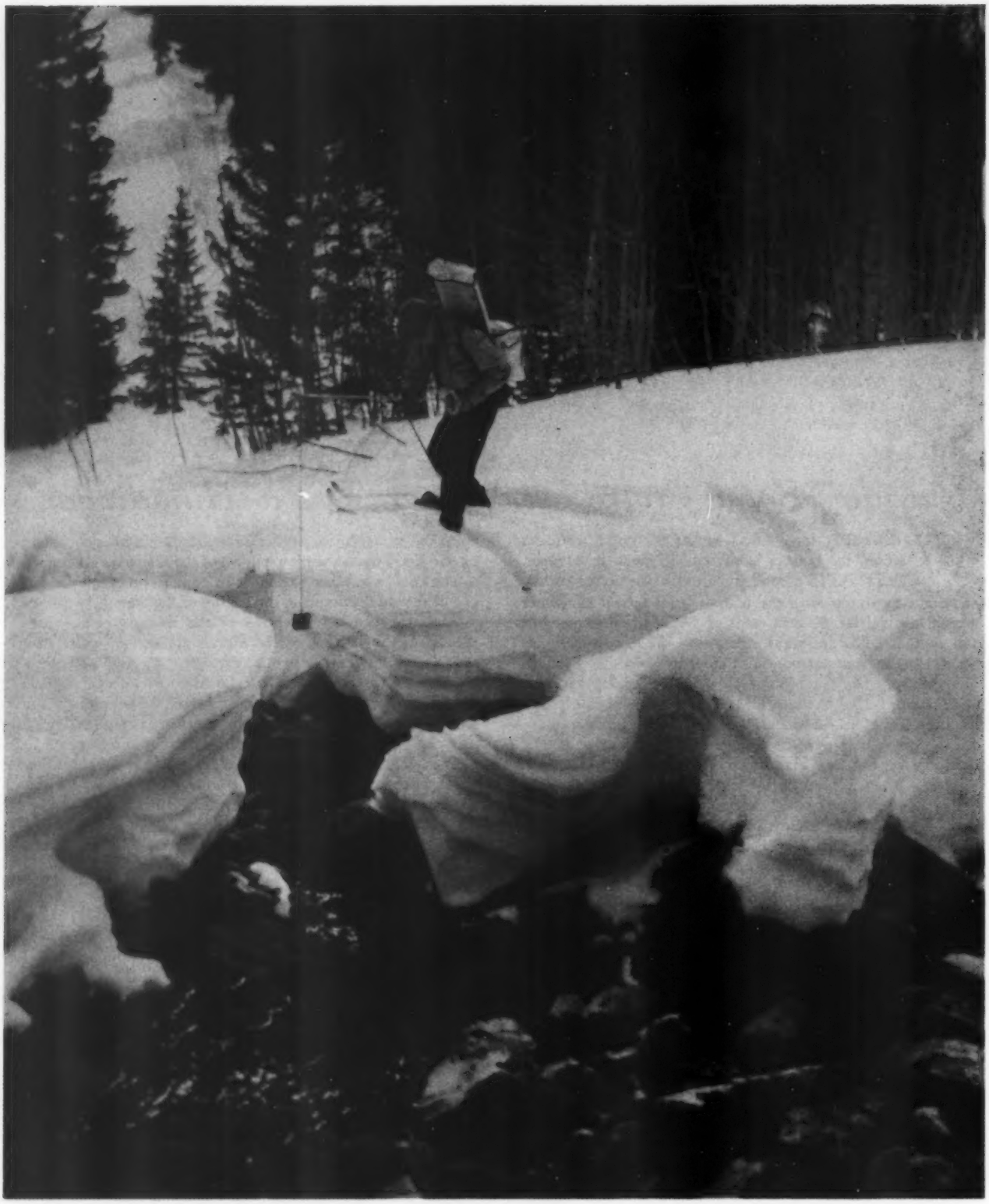
During the evolution of the cycles a tough winter struck Nevada a staggering blow last year. Storm after storm breezed over the mountain tops and down to the desert land with the speed of a flying saucer. These disturbances from the Pacific whipped winds and snow in all directions, piled up deep drifts in the canyons, clogged the highways where they were most vulnerable, gave people the "miseries" and caused a lot of overtime labor and expense to keep the roads clear so that traffic could go rolling through. Sometimes, during the four months of slippery sidewalks and giant icicles, the storms really got the best of us. They licked us to a frazzle for a while and defeated every effort to control conditions. Eventually, after a lot of puffing and sweating, we got the upper hand when the blizzards stopped for a refill, and after long hours and terrific strain the snow-plow pilots got the highways all cleaned so you could see black pavement in both travel lanes. It was one of the worst winters in the history of the State.

With the possible exception of the "banana belt"—that's the Las Vegas vicinity, where winters are seldom worse than they are in Florida—the entire State felt the grip of the icy blasts and low temperatures, and had to spend a great deal of time digging out from under. From Carson City and Reno in the west, to Elko and Ely in the east, that condition prevailed. The intermediate points didn't fare much better.

These storms came with both suddenness and sequence. One followed right on the heels of the other. When folks all over the State let down slightly after the weather man predicted the end of the storm, they would groan perceptibly when, in the next breath he would say "another storm is on the way within the next twenty-four hours." That took all the joy out of the job.

Every piece of snow fighting equipment the State Highway Department had was forced out of storage and into action. County highway departments had to do likewise. Together they faced Herculean tasks but kept at it until the storms were licked. These machines were put into service all over the State and kept working until the highways were sufficiently clear for the resumption of traffic. It wasn't the highway departments alone which felt the blow. Railroads, bus lines, airplanes and all motor vehicle traffic were affected by the extraordinary winter conditions which lasted from November until March. Cattle, sheep and horses out on the ranges and the grazing grounds were snowbound and almost helpless against the shrill whistle of the wind and the swirling of the flakes. Ofttimes the struggle seemed utterly hopeless but efforts were maintained until eventually success was achieved.

ROBERT BRANSTEAD of the Information Division, Soil Conservation Service, supplied the factual material concerning the Nevada Cooperative Snow Survey included in this article.



Water on the snow courses is plentiful but sometimes hard to get in liquid form while men are conducting their surveys. The old-fashioned method of using a tin can tied to the end of a string fastened to a stick is used to good purpose.

—Soil Conservation Service photos

Of course we could have waited until May or June and let the summer sun do the job for us, but Nevada didn't see it that way, as traffic had to keep moving.

This phase of Nevada winters has become more or less an accepted situation. Every preliminary precaution is taken even before the first snowflake falls in late October or early November. As a result, plans are put into effect which normally can dispel any adverse condition quickly after the storm strikes. Highway department equipment is repaired and ready by that time, and the crews are prepared for the winter battles.

There is another phase of our winter which has a more beneficial effect, although it involves considerable effort, risk and danger in its development.

Nevadans learned long ago that water meant life or death to the State's economy. They also know that their water supply is born of the melting snows, and carried down the hillsides to the lowlands by the rivers. Practically all of Nevada's agriculture depends upon irrigation by water taken from these rivers. Rivers like the Humboldt, Truckee, Carson, Walker, and a few smaller ones, never reach the ocean yet their waters are precious to the land they serve. Waters from these streams irrigate thousands of acres before they are lost in great sinks which so impressed the pioneers in this land. Nevada has gone in for water conservation in a big way. Many dams and artificial reservoirs play important parts in the agricultural success of the State.

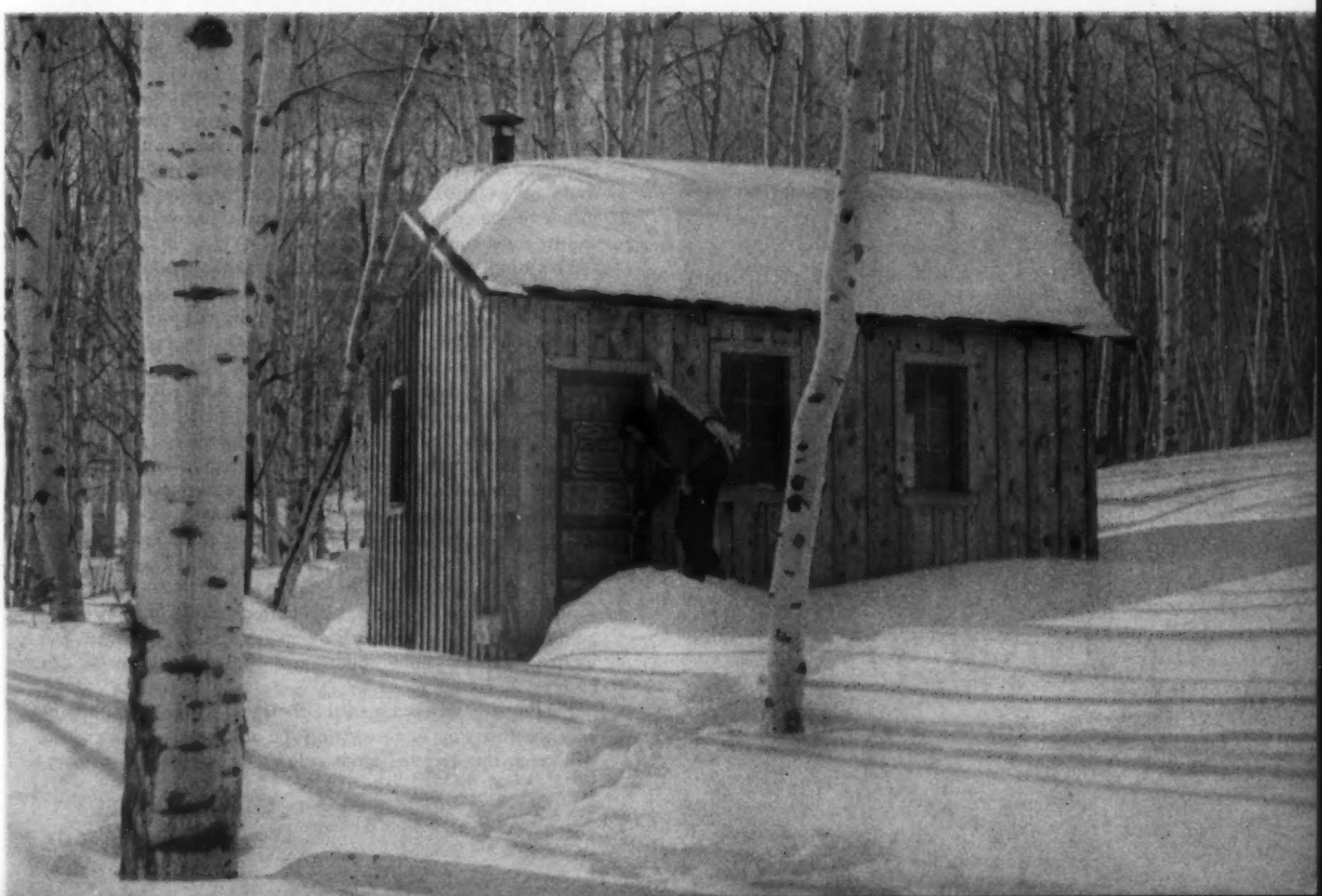
It seems natural, therefore, that we should contrive the first practical method of measuring the water content of winter snow and a method of evaluating the results in terms of water supply. To Dr. J. E. Church, a member of the University of Nevada faculty for many years, belongs the full credit for its original conception and successful development. Dr. Church's method is so simple and straightforward in its approach that, since it was initiated more than 40 years ago, there have been no subsequent important changes. Dr. Church developed "snow surveying" into a science recognized all over the world.

Snow surveyors always work in pairs, both for safety and as a team. They often go to their field of operation on a vehicle known as the "Sno-Cat" so that the trip can be made safely and with a modicum of comfort. Otherwise, travel to the various Nevada watersheds is by skis or snowshoes. The goal is a snow course which is simply a marked area on a particular watershed where snow samples are taken. Here the wind does not drift the snow nor is there a heavy tree canopy to intercept its normal fall. Open mountain meadows are usually the best for snow courses.

The snow course is marked by bright yellow and red iron pipes with signs on top. The easily seen markers are set up at the extremes of the course, frequently a quarter of a mile apart. At measured intervals between these markers the snow samples are taken, weighed, water content determined and recorded.

Measuring instruments consist of a number of pieces of aluminum tubing, each 30 inches long. The first tube has a row of sharp teeth at its lower end. It is threaded at the opposite end so that additional tubes can be firmly attached, until the combined tube reaches the required length to sample the entire depth of the snow to be measured. A two-handled driving wrench is usually added to the top of the tube. This tube is thrust straight down into the snow. If an ice layer

This cabin in the Baker Creek area of White Pine County is a mighty welcome shelterhouse to survey crews forced to remain in the mountains overnight.



"Boxcar" planes lined up on the Elko airport runway ready to carry food and forage to isolated ranchers and cattle in the winter of 1951-1952.
—Photos Courtesy Caterpillar Tractor Co.

Bulldozer equipped "Cat-Tractor" was used to break trails into the Ellison ranch of Elko County.

is encountered, the sharp cutting teeth will go through with a turn of the wrench. The tube is slotted on the sides and is also marked off in feet and inches. When it has been pushed through the snow to the ground level, the snow depth can be easily read.

When the tube is removed from the hole it contains a core of snow. Since the weight of the snow determines the water content, the designers of the tube by simple mathematics calculated that a core of snow with a diameter of 1.485 inches could be weighed and the result transposed into equivalent inches of water. A special scale is used to weigh the tube and its snow core.

The sampling tube has a tapered collar combined with the cutting teeth so the snow core will not fall out when the tube is withdrawn. The cutting end is carefully checked to be sure that dirt has been brought up as evidence of a complete core. A specially calibrated scale is also used. The core of snow is balanced on a cradle of the scales and weighed. When the weight of the empty tube is subtracted from this figure the inches of water content of the snow is the result.

Since one sample would not give an accurate indication of the over-all condition of the snow, it is necessary to take a number of samples at each course and average the results. These samples are taken at distances ranging from 50 to 100 feet apart. There is nothing glamorous or spectacular about the job. It is just plain hard work.

Sometimes the trip to the high-altitude snow course is tough going, often it is comparatively easy. It all depends on the weather and the snow conditions. At any moment it can become dangerous.

Finding the water content of the snow in the mountains is only the first step in forecasting the amount of runoff which will reach the irrigated lands below. It is necessary to com-

"Sno-Cat" transportation over deep snows to the survey courses in the rugged Ruby Mountains is invaluable during a midwinter trip.

—Photos Courtesy Soil Conservation Service

pare the figures taken from the snow fields with the subsequent measured stream flow for a number of years until a direct historical correlation can be established. Usually 10 years of these comparisons are needed before a forecast for future run-off can be made with accuracy. Nevada is particularly fortunate in this respect as many of the snow courses were established in the Sierra Nevada mountains more than 20 years ago. The first three courses were established in the Sierras in 1910. Today there are 101 courses, covering 10 major drainage basins.

Snow measurements are made on the first day of March and the first day of April of each year. The run-off forecasts are made as promptly thereafter as feasible in order to give agriculturalists the information as early as possible.

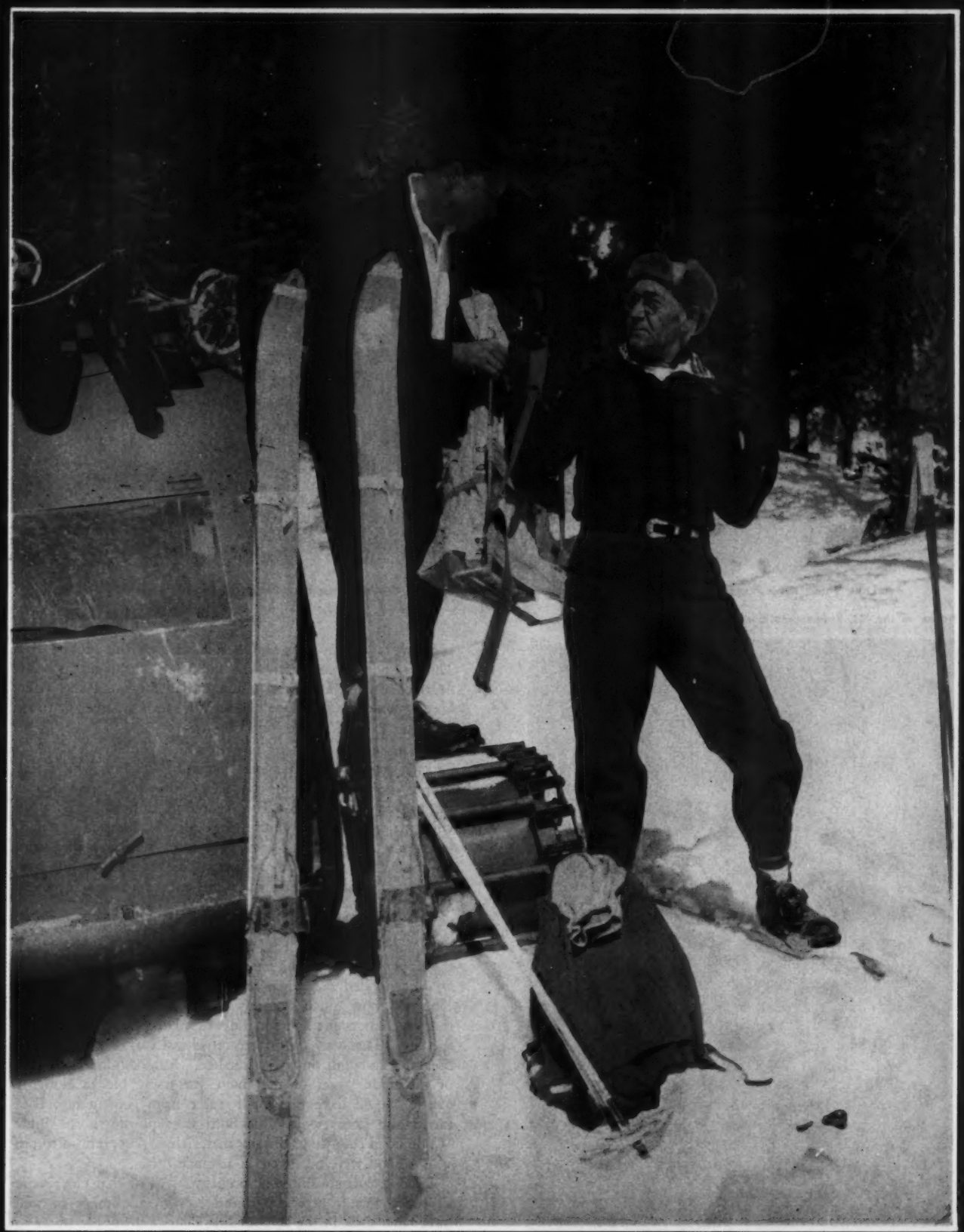
As the little groups of men on skis disappear into the white stillness of the mountain areas, it becomes understandable why "cooperative" is used in the Nevada Cooperative Snow Survey title. Ten different agencies, public and private, send the men or provide the funds to do the job. Most of the watersheds are in the national forests so one of the snow surveyors is usually a forest ranger. However, a great variety of individuals participate. Other agencies involved in the survey include the Weather Bureau, Geological Survey, State Engineer, County Agent, Soil Conservation Service, Forest Service, cattle ranchers, miners and others.

The snow crop in Lamoille Canyon, one of the most beautiful of all winter spots, is measured by an Elko jeweler, assisted by a local high school graduate; the snow course on Harrison Pass, in the rugged Ruby Mountains of Elko County, is ordinarily measured by sheepmen; the survey in the Spring Mountains of Clark County is made by the district forest ranger and a Bonanza Air Lines pilot. The pilot has the advantage over other surveyors because he can fly over the mountains

A Soil Conservation Service crew weighing the sampling tube and snow core at one of the stations.

Near Lamoille in Elko County, the Ruby Mountains 1951-1952 winter snow crop is held in the deep freeze for spring and summer use.

Fighting bitter winds, zero temperatures and rugged terrain calls for physical stamina in the Baker Creek, White Pine County, snow survey.



Nevada Soil Conservation Service color photographs.

Nevada Cooperative Survey crew working in the high levels of Lee Canyon, Charleston Park, Clark County, 30 minutes drive from Las Vegas and the desert. Snow to depths of many feet pile up as the winter crop. Upon melting and percolating into pervious strata the underground reservoirs are replenished. By measuring the snow depth and gauging water content, reliable and accurate forecasts of spring runoffs can be made. This data is particularly valued by ranchers.

Lake Tahoe never freezes over even during the coldest of winters. Here is a winter view near the north end of the lake.

Ski tracks on the Mt. Rose recreational area have a wavy pattern.

—Photos by Ernie Mack, Reno

and give a quick "look-see" before making the ground trip. The Nevada representative of the U. S. Fish and Wildlife Service, assisted by forest rangers, has measured the Baker Creek courses on the slope of Mt. Wheeler a number of times. This course is in White Pine County.

When shown the many uses to which people put water in Nevada, you will find some surprising reasons why water-supply forecasting by the Nevada Cooperative Snow Survey has proved so valuable. The Kennecott Copper Corporation, with major industrial workings at McGill, Nevada, regularly sends one of their men to assist the forest ranger in measuring the snow courses on Bird and Berry Creeks. The mining company uses much water in their smelter for processing copper ores.

The City of Ely lies in a small basin surrounded by a 90-square-mile watershed. When there is heavy snowfall in the upper reaches of the basin there is a good chance the city will be flooded out when the water begins to roll downhill. Knowing how much water is in the snow above has helped the city fathers prepare for the worst before it ever gets near the city. That very thing threatened last spring after a record breaking snowfall on the watershed. Sandbagging both sides of the main street of the town, for many blocks along its course, would have prevented water from getting into basements and stores which line both sides of the thoroughfare. While flood conditions did not materialize, preparations to prevent a flood were taken far in advance.

Las Vegas has a different problem. All of that city's water supply comes from underground. A great number of wells have been sunk in the surrounding district to supply water for this fast-growing, metropolitan, western town. Geologists

Galena Creek campground aside the Mt. Rose Highway as it looks in its natural winter decorations.

—Photos by Ernie Mack, Reno

On U S 50 at the south end of Lake Tahoe, mountains were deep in snow.

believe that the melting snow in the Spring Mountains west of town is the source. Snow surveys are now being used to correlate the relationship.

Lake Tahoe, on the California-Nevada border, was long the scene of bitter controversy over water, in and out of the lake. The level of the lake's waters must be kept at an elevation of between 6,223 and 6,229 feet. Many resorts and hundreds of property owners lining the shores of this beautiful body of water, situated 6,200 feet above sea level in the Sierra Nevada mountains, have millions of dollars in property values at stake; high water would flood them out. The irrigation and power interests whose dam blocks the outlet wants to get the maximum use of the water draining the lake and at the same time avoid the possibility of numerous damage suits. Their problem is one of maintaining a delicate balance of the lake's level. They must draw down the water to allow for the sudden rise when the snow melts. At the same time they cannot let the lake get too low. A snow survey of the Tahoe watershed is the best tool for anticipating when to open or close the gates.

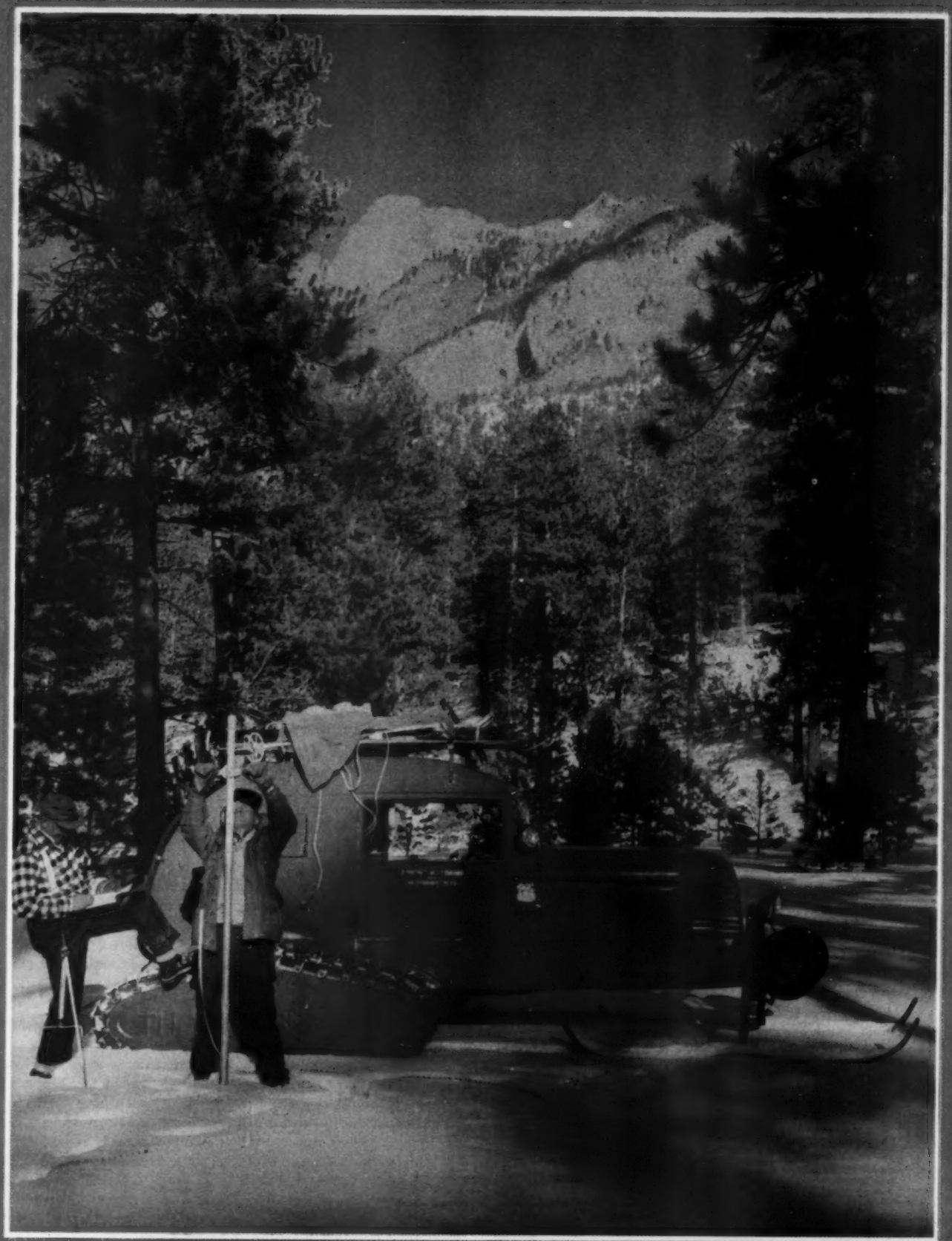
Water-supply forecast meetings are held in various places throughout the State. These meetings are of great importance to the farmers and ranchers in any particular watershed. Ranchers always abide by the decisions of these forecast meetings and set their crop plans accordingly. A poor year means less potatoes, grain, hay and pasture; an abundant snow crop means a bounteous crop yield. A thin snow crop means water will be budgeted for that particular area and, though not enough, each one would get his fair share. A plenteous snow crop and the budget restrictions are eased. That's the situation all over the State and the men who cultivate the State's acres have learned to depend entirely upon the water forecasts.

Nevada Soil Conservation Service color photographs.

Highway U. S. 93 courses along the bench between Ely and Pioche with snow-capped mountains as lonely winter companions.

Nevada Soil Conservation Service color photographs.

The Sno-Cat has solved many a snow survey problem in getting to and from the higher-level snow fields.



Nevada Soil Conservation Service aerial photographs.

Cooperation between the various governmental agencies is notable. Each unit makes its important contribution to the information available on the potential water supply of each watershed. Sometimes the work is dangerous. Often the trip to the higher altitude is rough going, and a slip may mean serious injury or possible death. Crews always travel together as much as possible.

What delicate patterns nature sketched in snow with the wind as a cutting tool on Mt. Rose, Nevada, last winter.

—Photos by Ernie Mack, Reno

Riverside Drive in Reno, lined with winter's leafless trees, is a winter wonderland.

Meetings are held annually in Elko, Winnemucca, Lovelock, Minden, Fallon, and Yerington for the purpose of giving information on water supplies as soon as possible. Usually these meetings are well attended by the water users in the individual districts. It means so much to them.

Men who go into the mountains to survey the snow are well aware of the importance of their job. When they come back to town to make their report to headquarters, the coordinating center, people seldom ask how deep was the snow, it is usually "how much water."

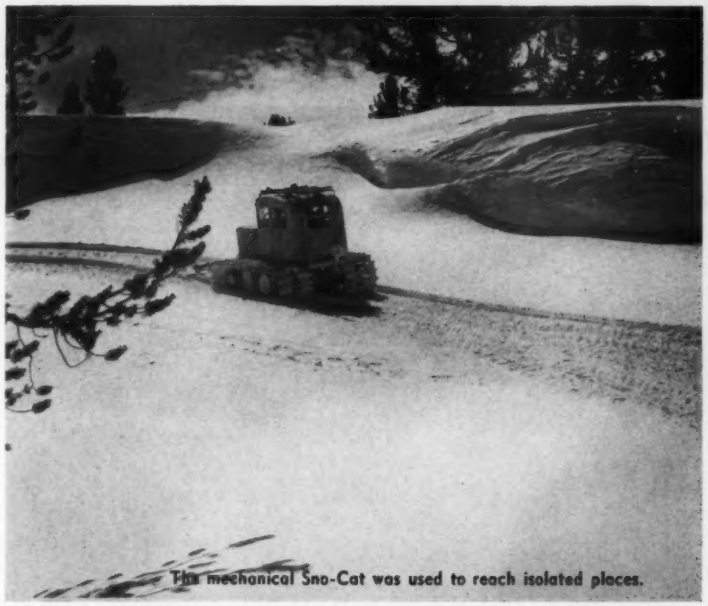
Clyde Houston, who tabulates, correlates and interprets the figures obtained in the various snow surveying districts, is employed by the Soil Conservation Service as an irrigation research specialist. When he is not making surveys he is working on methods to improve water conservation measures and to protect the rancher's soil from damaging erosion or poisoning by excessive alkali.

Snow courses are located in 11 general districts throughout the State. These courses are set up on the Snake River watershed, the Owyhee River, Upper Humboldt River, the Truckee Basin, the Lower Colorado River, the Eastern Nevada area, the Carson Basin, the Northern Great Basin, the Walker Basin, the Tahoe Basin and the Great Central Basin.

When winter storms strike, livestock out on the open range must be given attention. Sometimes the forage supply is distant from the place where cattle or sheep have been concentrated during storms and it becomes necessary to haul the forage to the animals. Heavy equipment such as bulldozers and Caterpillar tractors are put to use breaking paths to these supplies. These machines are also used to "break road" from the ranchers' homes or barns to the highways over which supplies must come to the aid of those in distress.

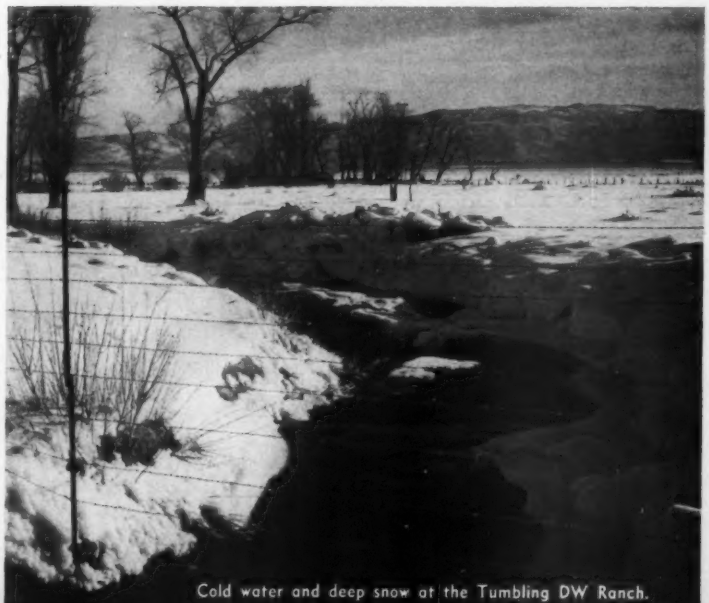
Deep snow marked the winter of 1951-1952.

Crossarms of telephone poles verify the story.



This mechanical Sno-Cat was used to reach isolated places.

Reno residents were not immune, they fought [illegible]



Cold water and deep snow at the Tumbling DW Ranch.

Young folks loved it; look at the skiing they got.

A Winter Wonderland Among Heavy Forests of the Sierra

The summit of the Sierra Nevada mountains extends in an irregular north-south direction about 40 miles west of the Nevada State line. All water, whether in the form of rain or snow, falling on the watershed to the east of this summit eventually drains into western Nevada. Its journey may be tortuous and swift, straight and placid, over boulders and sandbar, through gorge or meadow, but it always rolls toward Nevada, displaying its beauty in sunshine or shadow, through forest or glen, winter or summer. Here it appears in a winter garb of white which blankets the ground, leaving only its rocky trail free from the snow cover to mark its path.

Three well-known, but not big, rivers flow eastward from these mountains into the State of Nevada. They are the Truckee, the Carson and the Walker. All three have numerous tributaries, or forks, which eventually flow into the main stream. All three have their sources high up in the Sierra Nevada on the eastern flank. During winter months much snow falls on their watersheds and the resultant water in the spring and summer means life to the Silver State, particularly its agriculture. During the winter they form boulevards in the winter wonderland disturbed only by the beaver, the deer, the porcupine and the rabbit, and the snow survey crews. In the summer they comprise delightful mountain streams rolling through lovely areas, when the fish come to life and snap at the fly, and the cold water sings joyously as it rolls over rocks and fallen logs.

To determine the quantity of water which can be expected during the growing season in the western section of the State, snow surveys are made over marked courses throughout these watersheds. These surveys are made on March 1 and April 1 of each year.

The picture shown on these two pages was taken along the course of the Little Truckee River, somewhere near the Nevada State line.

The picture was taken by a member of the Nevada Cooperative Snow Survey crew.

One of the iron ore loading ramps at Colado, a few miles east of Lovelock, Nevada, on the Southern Pacific Railroad.

At Palisade, on the Western Pacific Railroad, cars are ready to load with hematite iron ore from the Simplot workings in the Cortez Mountains.

At the American Ore Company's ground, many tons of high-grade magnetite iron ore have been broken from one of the ledges and waits hauling to the railhead for shipment. Part of this ore goes to Youngstown, Ohio, and Detroit, Michigan.

Iron Ore Mining is Being Developed in the Silver State

IRON ORE mining in Nevada, on a large scale, started about a year ago. This new phase of Nevada mining has continued active ever since and has all indications of future expansion. While present undertakings are but initial steps toward a greater disclosure of ore bodies, it may take years to unfold the complete possibilities. Admittedly the margin of profit is small, but from knowledge already gained iron ore mining could become extremely important to the State. Remarkable progress has been made in the present projects, but there is no one bold enough to venture a forecast on its activity over a long period of time. The potential exists; that much has been definitely established. Surface outcroppings and open-pit operations, plus diamond drill testings, have disclosed some very large deposits in several districts of the north central and eastern part of the State. How much iron ore can be outlined through further diamond drill tests and continued surface and subsurface exploration remains for the future to disclose.

Many factors relevant to the successful growth and development face this newest mining enterprise in Nevada. There is little doubt that beds are far reaching and these can definitely be recorded as supplementary reserves in the event present dependent sources of iron ore in the nation become dangerously low or threatened with exhaustion. Quality of raw materials, efficient mining methods, market price for the product, low-profit factors, hauling distances from the source of supply, and market requirements are other angles which will determine the continued expansion and development of the State's natural resources in iron ores.

Two large areas of note, far removed from each other, are already affected while several other large, known deposits await more favorable conditions for vigorous study and exploration. Iron ore in great abundance exists in the State. No one can deny that. Whether these beds have a common origin, or continue as one underground deposit, no one at present knows. Large deposits are located several miles from other known deposits in the same general area, but there is no proof that they have one and the same parent source. It becomes an interesting problem to positively determine whether there is continuity or whether the beds are isolated zones where the ores manifest themselves. These are problems for future solution. A good start, however, has been made in the three or four large ore bodies now being worked. Many Nevadans are asking themselves the question: Is the production of iron ore going to give Nevada's mining industry the biggest stimulant it has experienced in many years, or will it prove to be only a temporary phenomenon born of uncertain world conditions as they exist today?

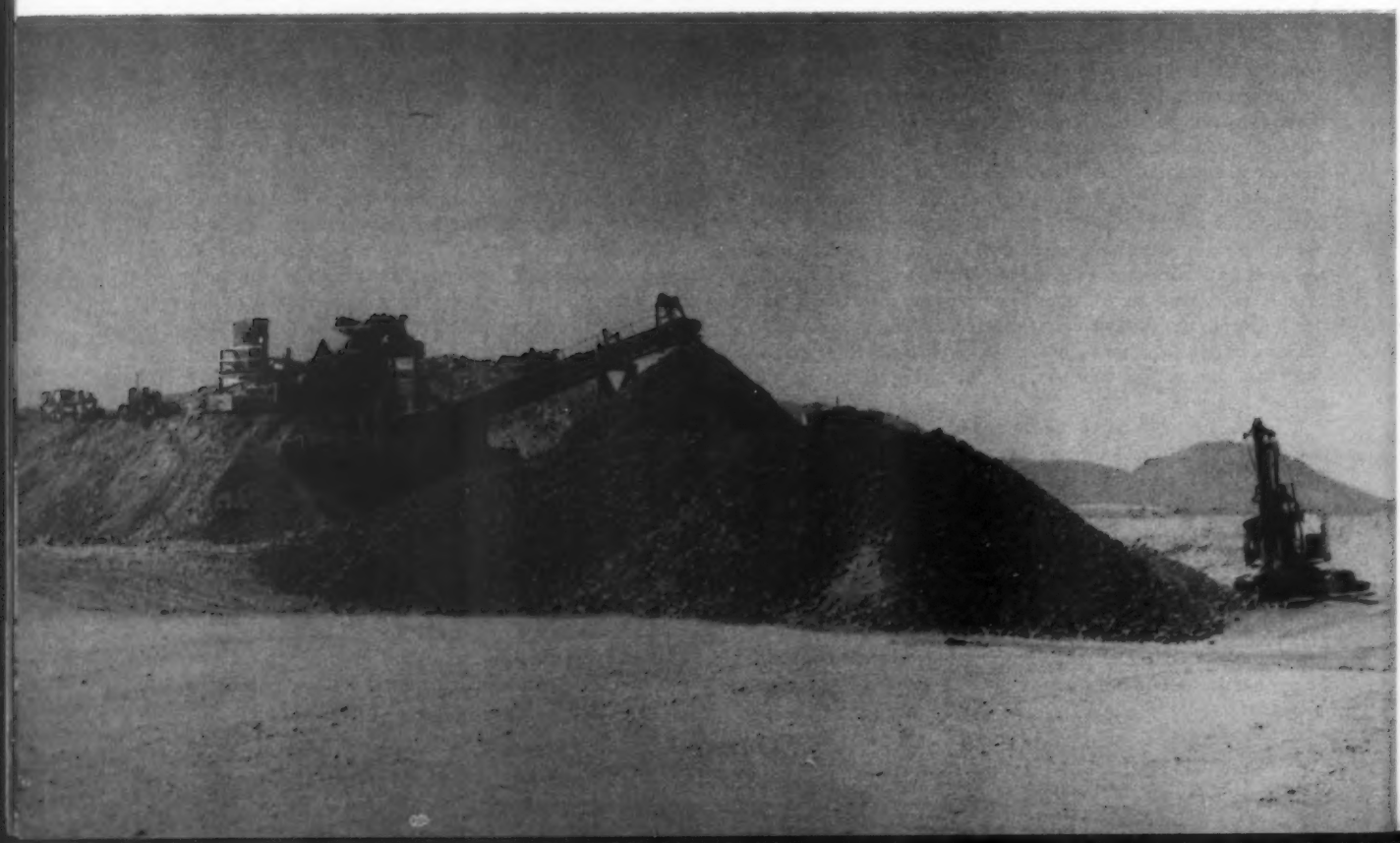
A definite answer to these questions is probably impossible. Opinions vary and run the gamut from complete optimism to dark pessimism.

Two important factors can be definitely established however. From a national viewpoint, Nevada's current iron ore production is extremely small. At the moment it does not appear it will ever be anything to compare with, say, the production of Minnesota's famous Mesabi Range.

Locally the iron mining may prove to be a highly important new industry. At least five properties are in actual produc-

The eastern section of the Dodge Brothers pit, 25 miles south of Lovelock, from which thousands of tons of magnetite iron ore have already been mined.

From the pit the ore goes to the crusher, then over the loading ramps to trucks which haul it to the railroad at Colado.



Western section of the Dodge pit, showing the high wall of magnetite ore from which power shovels scoop many tons of material daily.

tion currently, others are being surveyed, and still more are in the prospect stage. These properties are widely scattered in the north central and northeastern part of the State and at present more than 3,000 tons of iron ore, both of the magnetite and hematite variety, are being mined and shipped from the various deposits daily. In some mining circles this is an impressive figure. In the general field of iron ore production it doesn't total up too much—yet.

Just by way of comparison, the national total will probably stand somewhere between 100,000,000 and 115,000,000 tons annually.

A. C. Johnson, chief of the United States Bureau of Mines office in Reno, recently said it would be a mistake to dismiss the Nevada production as unimportant. He listed several reasons for that:

1. Iron is a strategic metal, and any increase in its production is worthy of note.

2. No one is quite sure, yet, just what the Nevada mines will amount to.

3. Should this Nation become involved in another all-out war "the comparatively small amount of iron ore now being produced here conceivably could make the difference between dangerous shortage and enough to do the job."

A critical shortage of steel in Japan, and the Japanese Government's willingness to sign contracts for the delivery of between 4,500,000 and 5,000,000 tons of iron ore has started Nevada on its schedule of production. Not all of that tonnage, of course, will come from Nevada. Small properties in several other Western States very similar to the ones being developed in Nevada, are being opened. Owners and operators of these developments have signed their own contracts with the Japanese Government.

At present Nevada ore is being moved from the open-pit operations by trucks to the nearest rail point from which it goes to one of two ports on the Pacific Coast. Some may go to Oakland, while much of the raw product is destined for Stockton, California, where port facilities have been expanded to meet the increased load. At the port the ore is placed aboard Orient-bound freighters which, in most cases, carry the ore as ballast. This helps keep transportation costs low.

Currently there are two principal centers of iron ore mining. Both are open-pit type excavations. The two deposits are located about 175 miles apart. One is in the Palisade area of northern Eureka County; the other is in the Lovelock area of Pershing County.

J. R. Simplot, a big industrial operator from Idaho, has secured operating control of the large deposits located 25 miles south of Palisade, where an entire mountain shows commercial grade hematite ore.

In the Lovelock area four groups are developing the deposits, which are more of the open deep-pit mining type. Here the Mineral Materials Company, the Dodge Brothers Construction Company, the American Ore Corporation, and the Nevada Iron Ore Corporation are mining and producing iron ore from four separate properties, three of which are adjacent to each other. The fourth mine lies eight miles north, and that distance closer to the railroad.

Practically all of the ore coming from the Mineral Materials

The Mineral Materials Corporation's big pit, across the hill from the Dodge workings. Besides mining and shipping, drilling tests are made to determine the outline of the ore bodies which, seemingly, are of great extent.

deposit, the Dodge pit, and the Nevada Iron Ore Corporation pit, is shipped to Japan on an individual contract basis. The American Ore Company has sent many tons of its magnetite iron ore to factories in the Middle West at Youngstown and at Detroit. The greater bulk of the ore, however, is hauled by trucks to the railroad at Colado, six miles east of Lovelock, on the Southern Pacific Railroad. As many as 40 carloads daily leave the loading ramps at Colado for the coast and the ships' bottoms.

From the Nevada Iron Ore Corporation's properties, eight miles west of the main deposit, 100 to 150 tons of 70 percent iron ore is selected and shipped daily.

Whether there is a subsurface connection between the two Lovelock districts has not been established and there are no surface indications that such is the case. But the two deposits may indicate, to some measure, the extent of the iron ore deposits available in Nevada's new mining field.

Dodge Brothers' open pit encompasses the largest current operation in the Lovelock area. Several power shovels are daily working in the pit, and after initial crushing for uniform size, many trucks haul the ore down the grade to Colado, over a good gravel road which is generally maintained by the companies themselves. Drilling operations are also carried on to determine the better spots for shovel operations. No attempt has been made to accurately estimate the available ore supply at the Lovelock deposit, but a conservative guess would run into several million tons.

The biggest individual Nevada producer at the present time is the Simplot firm which has the Modarelli lease in the northeast end of the Cortez Mountains, 25 miles south of Palisade.

From 1,000 to 2,000 tons of ore are moved by 40 trucks a day from the source of supply to the railhead at Palisade. From there the ore is loaded on gondolas and the Western Pacific transports it to Stockton. The Simplot firm closed a contract with the Japanese Government for more than 300,000 tons of iron ore to be delivered this year. Contracts are made on a year to year basis.

The Simplot Company is reported to be ready to close a contract with Japan for the delivery of more than 1,000,000 tons of hematite ore. Siding facilities at Palisade have been enlarged to care for stockpiling and loading.

When Simplot, a Western businessman who heads several corporations, with headquarters in Boise, Idaho, put the property into production last year, it marked the climax to half a century of sporadic activity in the Palisade iron ore district. The iron ore in the Cortez range has been worked intermittently since about 1900, though earlier shipments never approached the present scale of operations. Benches on the mountain from which the ore is extracted are approximately 7,000 feet altitude.

The iron ore deposit is on ground owned by the Modarelli family in Elko, Nevada, and is estimated to contain more than 30,000,000 tons of marketable iron ore. Ore is broken down by blasting, loaded on trucks with a power shovel, then hauled to the crusher and sizer at the mine. From the bin it is loaded to other trucks which carry it 26 miles down grade to the Palisade railhead.

In addition to the iron ore already mined in the Palisade and Lovelock areas, other properties have shown promise in eastern Nevada, and further investigation and study is being made by the United States Bureau of Mines in conjunction with the experts from the University of Nevada at Reno.

The Nevada Iron Ore Corporation pit, better known as the Blair and Thomas workings, is eight miles from its nearest mining neighbor, which suggests a possible widespread ore body in the Lovelock region.

Diamond drilling tests are also being conducted in the Lovelock area by the Ford Motor Company in an attempt to determine the extent of the deposits.

If the Nevada production jumps to 6,000 tons a day—which seems possible—and the ore averages $8 to $10 a ton, the State's industrial income will be increased by about $14,000,000 a year. In Nevada that is important money.

The ore deposits south of Palisade are extensive, beyond doubt. The deposits have attracted attention for 50 years.

Iron was mined at Barth, six miles west of Palisade, from 1900 to 1915 by the United States Smelting and Refining Company of Utah, which shipped the ore to its smelters near Salt Lake City for use as a flux in the smelting of other ores. This operation was continued until the workings went below the level of the Humboldt River, which flooded out the property. From this point south for more than 26 miles, iron deposits have been traced through the mountains. The Simplot site was first located by Mark Requa, noted Western mining man and associate of ex-president Herbert Hoover, about 1900. Requa incorporated the Amarillo Iron Company in 1915, and put a crew to work on the property doing development work, running a tunnel for a distance of 260 feet on the property to test the ore which averaged better than 50 percent pure iron.

At the end of the last war iron mining prospects in the West did not look so bright and Simplot let the property go. Later he reentered the picture and got his lease back from the Modarellis and proceeded to start negotiations with the Japanese.

Mining engineers and geological specialists, working on cooperative surveys and projects of the U. S. Bureau of Mines in association with the Mackay School of Mines of the University of Nevada at Reno, are undertaking a thorough study to determine whether other large deposits of iron ore exist in other parts of the State. When their field work is completed the material will be correlated, assembled and published as a University Bulletin, with comprehensive coverage of the entire field. This work will be printed sometime in the future.

Western Pacific Railroad engineers are currently making surveys with the view of extending their line, via railroad spur, directly to the Simplot property. This would facilitate transporting the iron ore directly from the mine to the coast for transhipment to ships bottoms. It would also obviate a 25-mile truck haul from mine to railhead, a method now necessary.

Three power shovels are operating daily at the Simplot mine to excavate the ore from the mountainside benches. The ore contains about 56 percent pure iron.

Cabins and tents have been set up at the mine site to accommodate the workmen. This eliminates a long drive to the nearest town, about 35 miles distant. At the camp the company maintains a mess hall, an assay building, storage facilities, and a field office. There is ample potent water available for mining and camp operations as it is currently conducted. Expansion of mining would necessitate expansion of water supplies, but these are believed to exist in adequate quantities in the nearby mountains, and in the valley flats. Good water, at present, is obtained from flowing springs in sufficient quantity for all purposes. Many trailers are now in the camp and some of the workers have brought their families for residence. Sanitary needs, while not of the city type, have been adequately provided and living in the camp is pleasant and comfortable.

In addition to the operating properties in the Simplot proj-

General view of the bench operations of the Simplot Iron Ore Company at the Modarelli lease, 25 miles south of Palisade in the Cortez Range of northern Eureka County and approximately 175 miles east of the Lovelock ore bodies. Over 30,000,000 tons of marketable hematite iron ore have been outlined here, with many more millions of tons suspected as potential in this mountain range. No one, yet, has been able to make an accurate measure of the full extent of this deposit of hematite ore.

At the Simplot workings the ore is crushed to uniform size before it is loaded onto trucks and hauled 25 miles down grade to the railhead at Palisade.

ect, research and prospecting work are conducted on adjacent ground, by other groups. The New World Exploration Research and Development Corporation has a detailed geological survey operating in the Frenchy Creek area which adjoins the Simplot ground. This Frenchy Creek area looks promising for future development, but the land will need considerable prospecting before it can be transformed into a producing iron ore mine. Diamond drills are now penetrating the subsurface to determine the possibilities of the property.

It is also understood that the Utah Construction Company, one of the largest contracting firms in the Intermountain area with headquarters at Salt Lake City, has obtained land on the far side of the Cortez range west of the current Simplot workings and are drilling test holes to determine whether iron ore, in marketable quantity, exists in that section. These drilling tests are located about two or three miles distant from the Simplot site but in the same range of mountains.

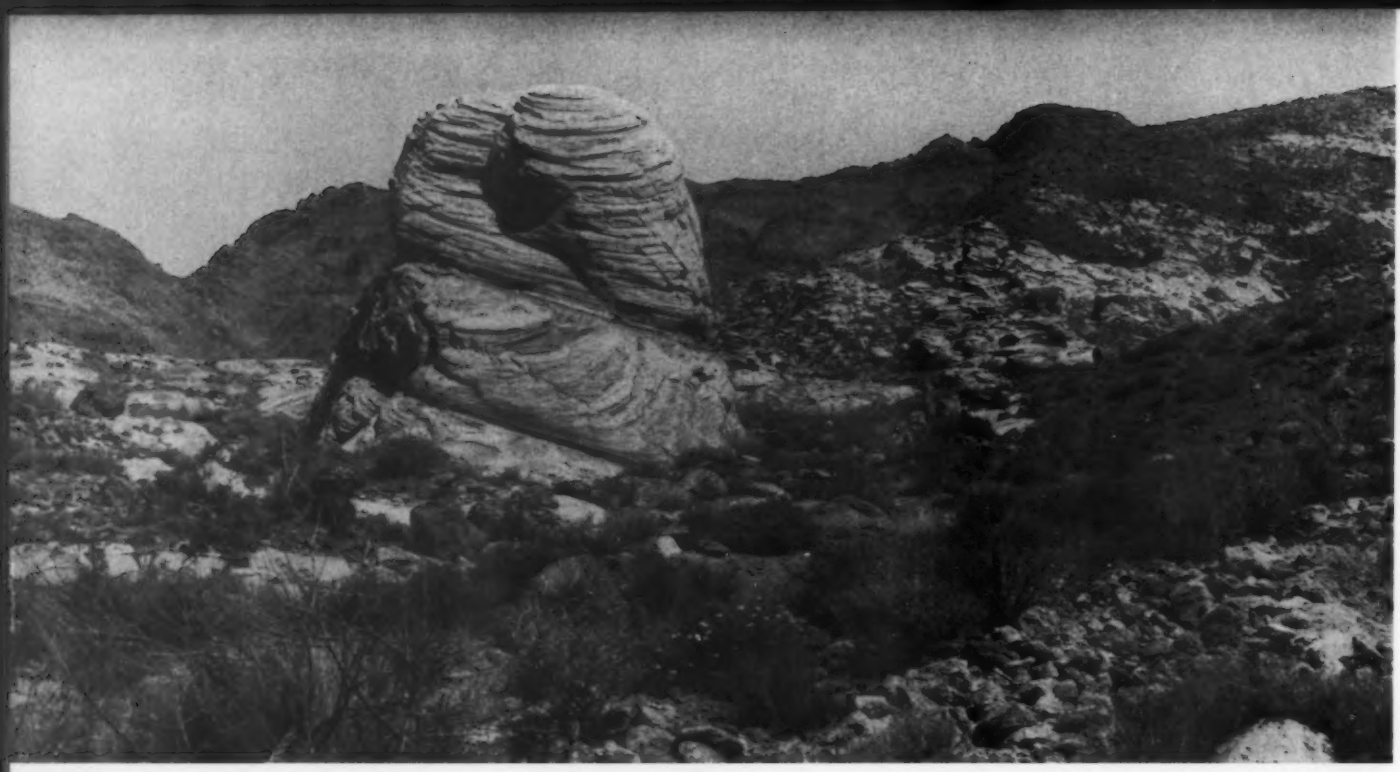
Shipment of iron ore from Nevada has created a boom at the Stockton, California, seaport. While Stockton is located 100 miles or more from the Golden Gate, the San Joaquin River at that point is navigable for ships of considerable draft and the city is an important Pacific Coast seaport. At Stockton the port authorities have installed a new belt conveyor, said to be one of the best of its kind in existence. This will be utilized in loading the Nevada iron ore. As a result of the installation of this new conveyor belt, Stockton is expected to take the lead in bulk ore shipment on the West Coast, according to its officials.

It has been determined that ore mined in Nevada can be transported to Stockton and other Bay Area ports at a profitable figure. While the margin of profit is very small, bulk production and efficient operation make success possible. If, as and when the railroad spur connects directly with the iron mines, transport charges could possibly be cut to make the profit margin more assured.

Hauling distances, currently, from the mines to the Stockton docks are long. From the Lovelock deposits it is more than 350 miles to the Stockton port, while the distance from the Simplot workings to the docks will approximate 550 miles. Iron ore prices in Western markets do not exceed $10 or $12 per ton.

While the present venture in Nevada operates on a narrow margin of gain, the broader view remains that the current development may disclose some extraordinarily large ore bodies which could be listed as future reserves for the nation.

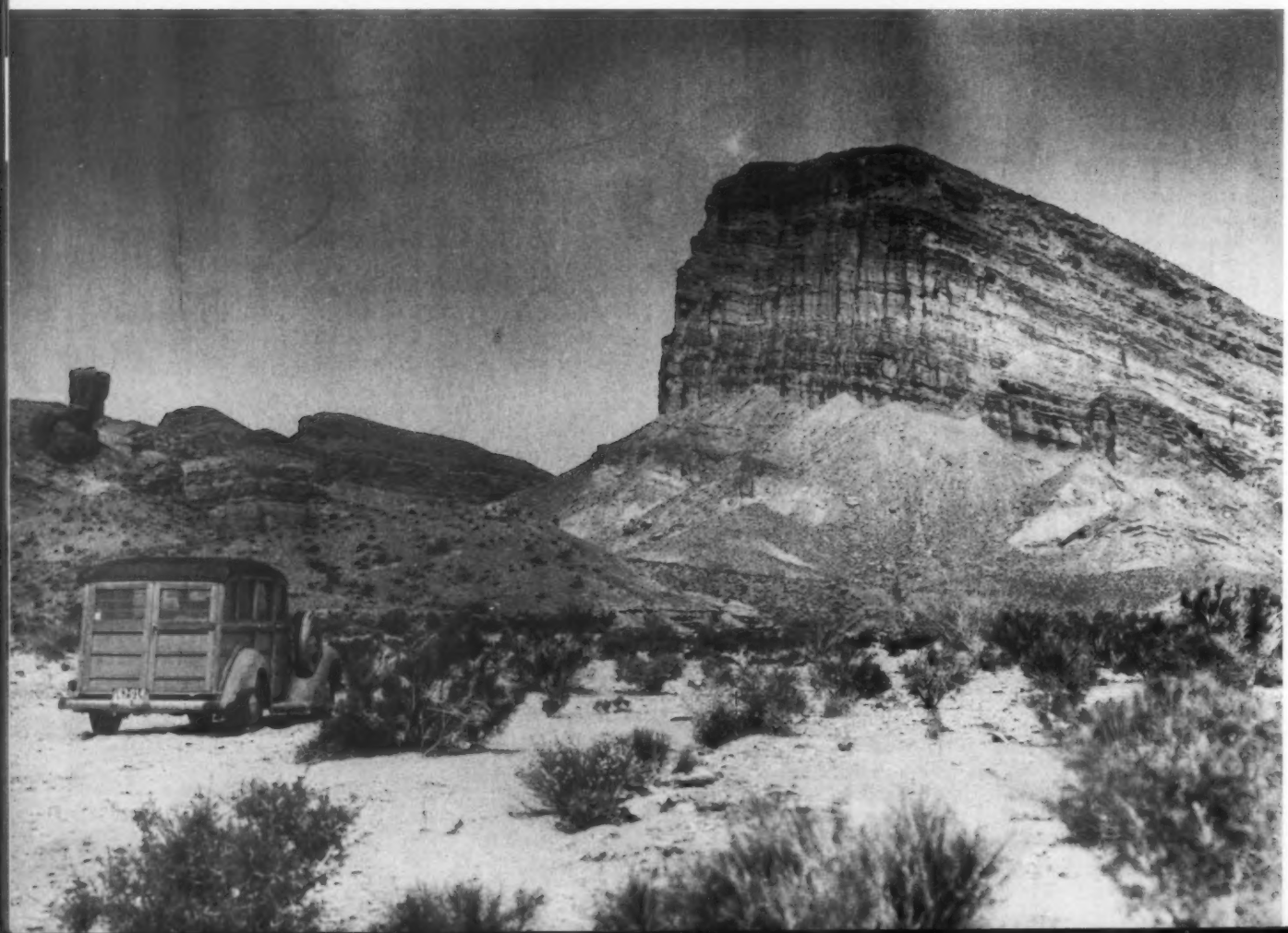
Current costs of labor, materials, transportation, taxes and overhead militate against any quick rich possibilities in iron ore mining at the present time. As long as present conditions prevail, Nevada's iron ore mining will be confined to a limited measure. In the process large reserves may be exposed. That is the true optimistic picture for the future. These reserves will come in handy when the nation needs them.



One of the peculiar sandstone formations in the Clark County area where bighorn sheep roam at will.

—Photos on pages 26 to 31 are by courtesy of James A. Lawrence, Gardnerville

Roads are but trails and one needs a rugged station wagon to follow such trails to the quarry's lair.



A corral in the shadow of a mesa where horses used in the bighorn sheep hunt were stabled while the hunters tramped the rocks to get their trophy.

Nevada Bighorn Sheep Hunt Brings Coveted Trophies

By JAMES NEGLEY, *Nevada Fish and Game Commission.*

NEVADA big-game hunters experienced a unique and thrilling hunt during the month of last April, when 50 lucky nimrods, selected by drawing, hunted Clark and Lincoln Counties for bighorn sheep and bagged 15 rams. The project, limited in number of participants, spread out over a field of operations covering several million acres of rugged, desolate desert and mountainous country in southern and southeastern Nevada.

Las Vegas, because of its strategic location, unofficially served as the center of activity and starting point for this vast hunting area. From this southern community, hunters spread out to the north, east and west in quest of their extremely elusive quarry. Local headquarters were set up at Overton, Mesquite, Moapa, Alamo, Searchlight, Indian Springs, or any other small community or ranch, where horses were readily available at the end of motor car travel.

The strenuous hunt called for every ounce of endurance, courage and stamina of a healthy human being in a section of the nation thoroughly isolated and extremely hazardous to the stranger. Barren mountains, high mesas, treeless valleys and jagged canyons are everywhere. Innumerable intersecting and crossing trails of the coyote and the jackrabbit among the mesquite bushes, form an utterly confusing network of unpaved and unmarked boulevards of the desert. Over this far-flung landscape and grand expanse, even to see a bighorn sheep perched atop a rocky crag, majestic in his pose and monarch of all he surveys, is something a seasoned veteran of the desert deems an accomplishment.

In spite of all the inherent dangers which a desert flaunts, the hunters, some saddle sore, some completely exhausted, others with strength to spare, tired, weary, and parched with thirst, enjoyed immensely the thrill of hunting the bighorn, the first of its kind in Nevada. Those who bagged their ram are still talking about the hunt, proudly display their trophies, eagerly show their photographs, and look forward to another year when another bighorn hunt might be scheduled.

The prime purpose of the hunt was to cull over-age animals, conserve the feeding range, improve the flock and maintain their healthy survival. The hunt was successful in every way, with many of the captured trophies outstanding in form and size. No accidents occurred, in spite of the terribly rugged terrain, to mar the sport of those who were lucky enough to join the chase.

The Silver State remains one of the last strongholds of the desert bighorn, scientifically designated as *Ovis Canadensis Nelsoni.* This animal formerly ranged in large numbers over Nevada, eastern California, Arizona and parts of other southwestern States. Advancing civilization, cultivated by the influx of man into remote areas of the West, brought disastrous results to the desert sheep which were depleted almost to the point of extinction.

Realizing the need for preserving an important segment of Western America's fauna, the Federal Government established an inviolate refuge in Clark County in 1936. Here these wild animals had full protection. Here the vanishing remnants of this noble animal flourished and their numbers steadily increased on the 2,250,000-acre refuge. Here the flocks recovered from the hard blow dealt by man, aided and abetted by diseases conveyed from man's domesticated sheep flocks.

Meanwhile, other bighorn flocks outside the protecting limits of the refuge, which had survived the ravages of disease and the guns of poachers, also managed to maintain themselves and to increase in number.

High, rocky tablelands barren of vegetation are the natural habitat of the bighorn and he's hard to catch. Hunters bagged only the over-age rams which had the curled horns. It required lots of stamina and fortitude to hunt in this land of many natural hazards.

James A. Lawrence, of Rock Creek Ranch, Gardnerville, Nevada, a noted western photographer and artist, is also a good shot as a big game hunter. "Jim" took all the photographs in this magazine to illustrate the bighorn article.

Another color picture of the country in which the hunters found themselves chasing an elusive prey. Probably as isolated as any place in the nation, this Mormon Mesa country has a drab but impressive and colorful beauty enhanced by occasional patches of wildflowers.

It was in this category that the hunt was conducted.

Little attention had been given to the growing bighorn population until recent years, when the Nevada State Fish and Game Commission took a renewed interest in the sheep. It was noted that the flock outside the refuge had steadily grown in numbers with a consequent danger of overfeeding on the ranges. In 1952, the State game agency concluded that to improve the flock some over-age rams could be culled from the ranges. In addition to conserving the forage by removing some of the old rams—which bear the curled horns so much desired as trophies—the breeding potential of the flock might be improved. At any rate the sheep would be moved around a bit and the hunt would not be detrimental to the future preservation of the sheep. So it was decided to hold a limited, controlled hunt from April 12 to April 29, with 50 tags to be awarded lucky hunters through a drawing. The limited number was decided upon for two reasons—First, the Commission game technicians believed that any number in excess of 50 sheep harvested might have an adverse effect upon the welfare of the bighorn flocks; and Second, not all hunters who might wish to participate in the hunt could be accommodated. To tie in with the game management feature of the hunt, 50 seemed to be a well-chosen number. Also, the hunt would afford a method of securing more information concerning the habits and characteristics of the bighorn.

Arrangements were completed for the big event, the first of its kind in our State. Great interest in the hunt was manifest in all sportsmen's circles. Plans were designed to carry out the project under complete control, areas were mapped in detail, game technicians took the field for last-minute observations on the bighorn and guides were selected to direct the sheep hunters.

In the rough, broken country where the hunt was to be staged, the average hunter, unfamiliar with the territory and the sheep, would be at a great disadvantage. The sportsman's chance of bagging a trophy would be remote, indeed. The Fish and Game Commission selected as guides, eight local citizens, men familiar with every foot of the sunseared peaks and boulder-studded canyons of the vast hunting area. Men who had spent most of their lives as prospectors, buckaroos, or ranchers in the country to be covered, were chosen and they were men of high reputation. The idea of requiring guides did not meet with universal approval among hunters at first, but after the initial view of the terrain and a few days spent pursuing the elusive animal around rimrocks and canyons, most of the hunters were all in favor of the guide rule. Those hunters who took trophies were particularly appreciative of the help the guides contributed to their successful chase.

Bighorn sheep are thoroughly at home among the soaring pinnacles and rocky crags found in the broken foothills of northern Clark County. They fit right in with the color and kind of landscape. Just like finding a needle in a haystack. So it was up to the hunters to use their utmost skill and track the animals down in their own lair.

Horses were used to ride the country until it became more feasible to track on foot. Hunters pitched overnight camps in likely places among those crags and knobs where his majesty the bighorn keeps watch over his harem. Horses were tethered and fed, as close as possible to the field of action, food had to be prepared in open camp fires and the best that

"Jim" Lawrence (right) and guide, with their trophy bagged in southern Nevada last April. Fifteen of the over-age bighorn rams were harvested in the culling project to improve the herds. Sheep on the government refuge have perpetual protection, and only sheep outside the refuge were hunted.

could be said about the night's rest is that the sleeping bag may have been a little softer than the rocks on the ground. The canopy of stars overhead, in the stillness of the night, should have been inspiring if a dog-tired hunter could derive any satisfaction from that angle.

The desert air of southern Nevada is tricky. While daylight temperatures may reach 100 degrees, the early morning chill is a sharp reminder that winter is reluctant to be on its way. Guides wrangled the horses and secured the bridles and saddles, and got everything ready for the day's gruelling trip.

Let one of the successful hunters take it from here:

"Throughout the first day we scanned the horizon in all directions for signs of the bighorn. Each ridge, each rocky point, each canyon and draw was searched carefully with the binoculars to detect any movement in the distance.

"No signs of bighorns were seen during the entire first day, and at night we needed nothing to lull us to sleep. All hands turned in as soon as the camp chores were finished and soon were 'dead to the world.'

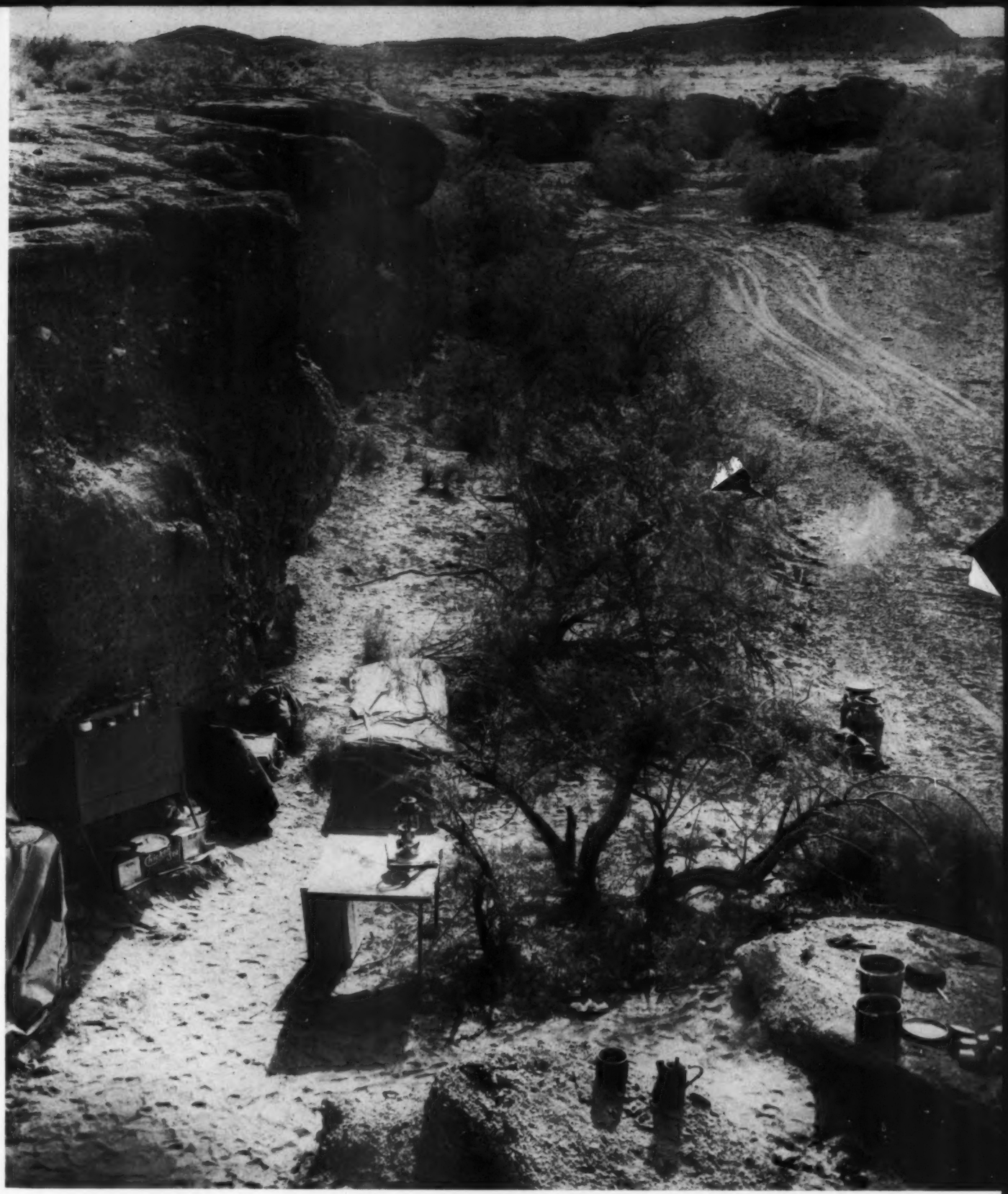
"After what seemed an endless ride on the second day, we came to the face of a sheer cliff. Here the horses were tied near a small spring and we began an arduous, lung-popping climb toward a jumbled peak, whose broken top seemed miles above. Stops were frequent. Between the heat of the desert and the steep climb, breath came through labor. The way was treacherous and difficult. One false step and we might have gone down the cliff much faster than we came up. The guide's advice was 'Pick each step with care and above all, don't roll rocks down on your pardner.'

"Eventually we reached a landing place and stood on a jumbled mass of rocks, which, a long time ago, had rolled down from the top of the peak. The guide led us to the edge of the rock slide and pointed down. We were standing above a sheep trail, deep and well defined in the gritty mountain soil. Hearts jumped and guns were checked quickly, for this was the first hot sign of a bighorn. One of the footprints was big, broad and deep—and fresh. A ram, a big ram and not far away.

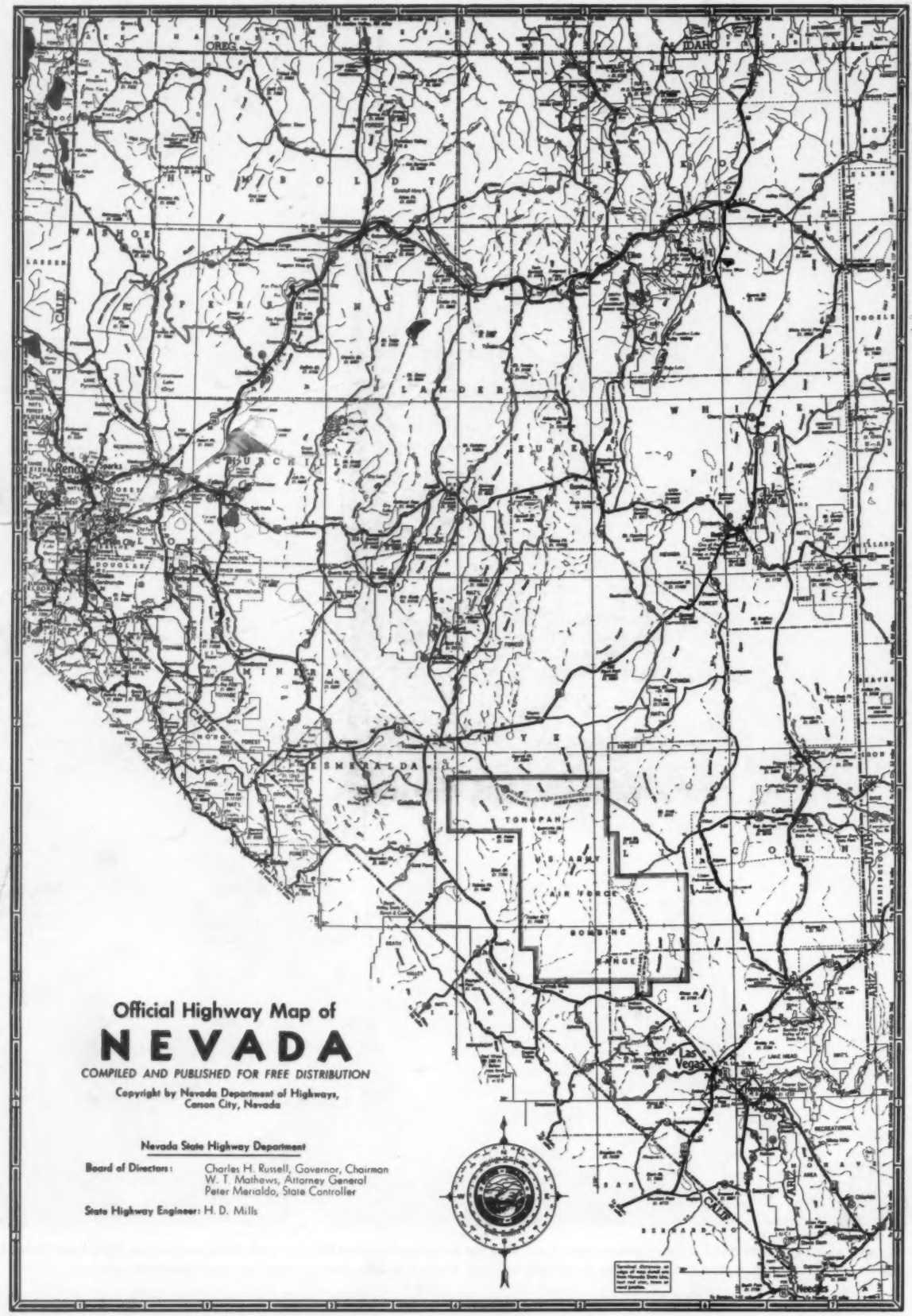
"The guide crawled cautiously toward a small boulder-tipped rise. He looked over the ridge and quickly ducked back. Then he turned, crawled back toward us and waved, out of sight of anything on the other side of the rise. On hands and knees, ignoring the pang of the sharp rocks, we crept toward the guide. At the crest we peered over—the guide gestured toward the far hillside. There they were—

"Feeding quietly, a group of bighorns scattered along the steep hill face, were across a deep canyon. In among the flock was a big ram, trophy size, with a massive curl of horns.

"As the echoes of the gunfire faded, the ram rolled over, slowly at first, then gathered speed going down hill. His carcass finally stopped, firmly wedged against a big rock, safe at last for the hunter. We crossed the head of the canyon and stood above the fallen animal—it was a good trophy. We bagged our ram."



The Bitter Spring camp where Lawrence and his companions rendezvoused when not tramping the rocky hills in search of the elusive Ovis Canadensis Nelsoni, or bighorn sheep. Nevada is now one of the few southwestern States where this wild animal is found in any appreciable numbers.



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